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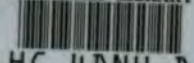
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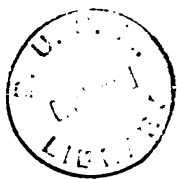


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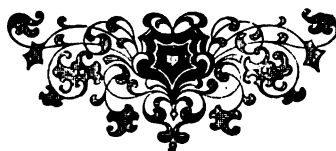
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A MANUAL  
OF  
PHYSICAL DIAGNOSIS

BY  
FRANCIS DELAFIELD, M.D.,  
AND  
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1878.





## P R E F A C E.

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THIS Manual is intended for the use of those who have to teach and to learn the art of physical diagnosis. It is made as concise as possible, and bound interleaved that it may be taken into the wards, and used as a note-book as well as a guide.

It is impossible to prepare such a Manual without making use of the works of Walshe, Flint, and Sibson, and I have done so freely.

The drawings have been prepared by Dr. Stillman, and are original. The idea of superimposed plates is, of course, an old one, but is of much practical value.

The object of the entire work is to furnish a sort of skeleton, to which each one may add the facts furnished by his own observation.

FRANCIS DELAFIELD,

12 WEST THIRTY-SECOND STREET.



# PHYSICAL DIAGNOSIS.

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## METHODS OF EXAMINATION.

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In the examination of the thorax and abdomen we make use of Inspection, Palpation, Mensuration, Succussion, Percussion, and Auscultation.

### PERCUSSION.

In practising percussion we may simply use the fingers, or we may employ any of the different varieties of hammers and pleximeters.

If you use your fingers, you apply the palmar surface of the left index or middle finger to the patient's body, and you strike this with the tips of the fingers of the other hand. If possible, the finger used as a pleximeter should be applied directly to the skin. It is important that this finger should be pressed closely to the patient's body, so as to form, as nearly as possible, a continuous substance with it. In striking this finger you should make a blow, not a push. Imitate the hammers of a piano-forte. It is more important to elicit a correct sound than a loud one. The sounds are made more distinct by placing the patient with his back against a door, which acts as a sounding-board.

### THE SOUNDS PRODUCED BY PERCUSSION.

There are four characteristics to be noticed in every sound which we elicit by percussion. These are: Quality, Pitch, Intensity, Duration. The Quality of a sound is the individual peculiarity which distinguishes it

from other sounds, apart from its pitch, duration, and intensity. Thus every musical instrument produces sounds of a quality peculiar to that special instrument. The Pitch of a sound means the same as the term does in music. We obtain percussion sounds of many grades of high and low pitch.

The Intensity is simply the loudness of the sound.

The Duration is the length of the sound.

#### PERCUSSION OF THE NORMAL THORAX AND ABDOMEN.

Over the normal chest and abdomen we obtain by percussion four different kinds of resonance: Pulmonary Resonance, Dulness, Flatness, and Tympanitic Resonance.

1. Pulmonary Resonance is the resonance obtained over healthy lungs. Its quality is pulmonary, its pitch is low, its duration is considerable, its intensity varies in different chests.

2. Dulness is an altered pulmonary resonance. It is heard where the chest-wall is thickened by bone and muscle, or where the liver and heart are in contact with the lung. Its quality is imperfectly pulmonary, its pitch is high, its duration is short, its intensity is not great. There are many degrees of dulness.

3. Flatness is not an absence of sound, but a sound produced by percussion of certain parts of the body. It is heard over the solid viscera, the liver, spleen, and kidneys, and over the thick muscles of the back. Its quality is flat, its pitch is high, its duration is short, its intensity is not great. Flatness differs from dulness chiefly in its quality. It is not a mere degree of dulness, but a sound of different quality.

4. Tympanitic Resonance is a sound of a peculiar quality, called tympanitic. It is heard over the stomach and intestines. Its quality is tympanitic, its pitch is high or low, its duration is considerable, its intensity is marked. The characteristic feature of tympanitic resonance is its quality. This quality is something positive. A sound may have any kind of pitch





or quality; but if it does not have this one peculiar quality, it is not tympanitic.

### REGIONS OF THE CHEST AND ABDOMEN.

As a matter of convenience, the surface of the chest and abdomen is divided into a number of regions, which are designated by arbitrary names. Over the thorax there are so many natural bony landmarks that these regions are not of so much importance; over the abdomen they are very useful.

It is absolutely necessary to know the positions of the thoracic and abdominal viscera. They may be seen in the plates.

The following enumeration of the viscera situated in the different regions of the abdomen is copied from Quain's "Anatomy":

- |                      |  |
|----------------------|--|
| Epigastric Region.   | The right part of the stomach, the pancreas, part of the liver, and the aorta.   |
| Hypochondriac, right | Right lobe of the liver, the gall-bladder, part of the duodenum, the hepatic flexure of the colon, part of the right kidney, with its supra-renal capsule.   |
| Hypochondriac, left. | The large end of the stomach, the spleen, the narrow extremity of the pancreas, the splenic flexure of the colon, the upper part of the left kidney, with its supra-renal capsule, and sometimes part of the left lobe of the liver. |
| Umbilical.           | Part of the omentum and mesentery, the transverse colon, the lower part of the duodenum, some parts of the jejunum and ileum, the abdominal aorta.   |
| Lumbar, right.       | The ascending colon, lower half of the kidney, and part of the duodenum and jejunum.   |
| Lumbar, left.        | The descending colon and lower part of the left kidney, with part of the jejunum.  |
| Hypogastric.         | The ileum, the bladder, if distended, the gravid uterus.   |
| Iliac, right.        | The cæcum, the appendix vermiformis, the lower end of the ileum.   |
| Iliac, left.         | The sigmoid flexure of the colon.  |



## THE EXAMINATION OF THE NORMAL CHEST AND ABDOMEN BY PERCUSSION.

Supra-clavicular  
Regions.

On both sides of the body the small regions just above the clavicles, into which project the apices of the lungs, give dulness on percussion. The sound becomes more pulmonary if the lungs are fully inflated. In percussing these regions hold the fingers so as not to get the resonance from the clavicles or sternum.

Infra-clavicular Re-  
gions.

On the left side, in front, from the lower edge of the clavicle to the upper edge of the third rib, there is pulmonary resonance. On the right side, in front, from the lower edge of the clavicle to the top of the fourth or fifth rib, there is pulmonary resonance, usually of higher pitch than that on the left.

## Precordial Region.

Over an area corresponding to the size of the heart, as seen in the plate, there is dulness on percussion; where the heart is uncovered by lung this dulness is more marked, or there may be flatness. Where the sternum covers the heart, the bone changes the quality of the percussion note.

## Hepatic Region.

On the right side, in front, there is dulness on percussion, from the upper edge of the fourth or fifth rib to the free border of the ribs. Over the sixth and seventh ribs, in the same region, there is usually flatness.

## Sternum.

Over the entire length of the sternum the resonance is pulmonary in character, but of increased intensity and of altered quality. The pulmonary quality is more apparent if gentle percussion is used. From the level of the third rib to that of the eighth cartilage the resonance over the sternum is rendered dull by the heart.

Left Hypogastric  
Region.

Over this region there is often tympanitic resonance, especially if the stomach is dilated.





- Anterior Abdominal Region.** There is usually tympanitic resonance over the entire anterior abdominal wall, except in the upper part of the epigastrium, where the left lobe of the liver gives dulness.
- Supra-scapular Regions.** Over both supra-scapular regions there is dulness on percussion. The more muscular or fat the individual, the greater the dulness. The pulmonary quality is rendered more evident by forcible percussion.
- Scapular Regions.** Over both scapulæ the percussion sound is also dull. The thinner the patient, the less evident the dulness. The pulmonary quality is made more evident by forcible percussion.
- Infra-scapular Regions.** From the angles of the scapulæ downwards, on both sides, for a distance of about five inches, in adults, there is pulmonary resonance on percussion. Below this, over the rest of the back, the percussion note is flat. The line of flatness is usually about an inch higher on the right side than on the left.
- Axillary Regions.** In the line of the axilla, on the right side, there is pulmonary resonance from the axilla down to the fifth rib; at that level there is dulness. The dulness extends down to the seventh rib, at which level there is flatness. The flatness continues down to the free edge of the ribs. On the left side dulness begins at the level of the sixth rib; at the level of the seventh rib, and below it, there may be either dulness, flatness, or tympanitic resonance.
- Inter-scapular Region.** Over the regions between the inner edge of each scapula and the vertebral column there is pulmonary resonance on percussion.

#### PERCUSSION IN DISEASE.

The varieties of percussion sound heard in disease are: Pulmonary Resonance, Dulness, Flatness, Tympanitic Resonance, Amphoric Resonance, and Cracked-pot Sound.

1. *Pulmonary Resonance*.—The pitch and the intensity of pulmonary resonance may be changed. The pitch is higher and the intensity greater over one lung when the other lung, from any cause, does not respire; over lung floating on the top of fluid; over the lungs in cases of emphysema; over the ribs when they are unnaturally dry from old age or disease.

2. Dulness may be heard over those parts of the chest where normally there is pulmonary resonance, and it may be increased over those parts of the chest where it is heard in health.

Dulness may be produced or increased—

- (1.) By any cause which thickens the chest-wall: pleuritic adhesions, tumors.
- (2.) By accumulations of fluid in the pleural cavities.
- (3.) By any solidification of the lungs: œdema, hemorrhages, pneumonia, phthisis.
- (4.) By emphysema of the lungs in some cases.
- (5.) By hypertrophy of the heart, liver, and spleen; by aneurisms, by abscesses, and by tumors.

3. Flatness is produced by—

- (1.) Very thick pleuritic adhesions.
- (2.) By large accumulations of fluid in the pleural cavities.
- (3.) By complete consolidation of the lung, especially if the lung is closely adherent to the chest-wall.
- (4.) By hypertrophy of the viscera, by aneurisms, by abscesses, and by tumors.

4. Tympanitic Resonance is heard over air in the pleural cavities, over large cavities, over solidified lung, over lung compressed by fluid, and in some cases of emphysema.

5. Amphoric Resonance is a variety of tympanitic resonance, with a peculiar musical quality. It is heard over large cavities, over air in the pleural cavities, over solidified lung.

6. The Cracked-pot Sound is also a variety of tympanitic resonance, with a peculiar metallic quality.





In order to obtain this sound, the patient should keep his mouth open while percussion is made. The sound is heard over cavities, over solidified lung, over lung compressed by fluid, and over the infra-clavicular regions of some healthy children.

#### AUSCULTATION OF THE BREATHING IN HEALTH.

In listening to the breathing we must distinguish the inspiration and the expiration. Of each of these—the inspiration and the expiration—we must notice the quality, the pitch, the intensity, and the duration. Over the healthy chest we can hear three kinds of breathing: Pulmonary Breathing, Bronchial Breathing, and Broncho-vesicular Breathing.

1. *Pulmonary Breathing.*—The inspiration is of pulmonary quality, low pitch, considerable duration, and variable intensity. The expiration is of pulmonary quality, of lower pitch, of short duration, of variable intensity. It is absent in many healthy chests. In the right infra-clavicular region both inspiration and expiration are often of higher pitch, and the expiration is longer than over the rest of the chest.

In children the breathing is usually more intense. In old age the expiration is often longer. There is much difference in the intensity of the breathing in the chests of different healthy adults.

2. *Bronchial Breathing.*—The inspiration is of tubular quality, of higher pitch, of marked intensity, and of considerable duration. The expiration is of tubular quality, of higher pitch, of greater intensity, and of longer duration than inspiration. This kind of breathing is heard over the larynx, the trachea, and the upper part of the sternum.

3. *Broncho-vesicular Breathing.*—This variety of breathing is intermediate in its character between pulmonary and bronchial breathing. It may partake of the character of each. The quality approaches to that of bronchial or of pulmonary breathing. The pitch is higher than that of pulmonary breathing; not as high as that of bronchial breathing. The expiration is longer and higher pitched than in pulmonary



breathing. This kind of breathing can often be heard in the inter-scapular region.

### THE BREATHING IN DISEASE.

1. Exaggerated or puerile breathing is heard over the lungs of children, over a lung or a part of a lung which is doing extra work, and over the lungs in some cases of vesicular emphysema.

2. Diminished breathing is heard over lungs into which less air than usual is inspired. Very frequently this is the case in phthisis and in emphysema. To judge of diminished breathing it is usually necessary to compare the breathing over the suspected portion of the lung with the breathing in other parts of the lungs.

3. Suppressed breathing is observed when very little or no air enters the lungs. This may be the case in pleurisy with effusions, intra-thoracic tumors, obstructed bronchi, pneumonia, and phthisis.

4. Bronchial Breathing.—Its quality is tubular or bronchial, its pitch is high, the expiration is longer and higher pitched than the inspiration. It is heard over consolidated and compressed lungs, and over cavities.

5. Broncho-vesicular breathing, intermediate in its characters between bronchial and pulmonary breathing, is heard over lesser degrees of consolidation and compression of the lung.

6. Cavernous Breathing.—Its quality is cavernous, its pitch low, the expiration is longer and lower pitched than the inspiration. The name is used to designate the character of the breathing, not the way in which it is produced. It is heard over cavities, over consolidated lung, and over compressed lung.

7. Amphoric breathing resembles cavernous breathing, except in its quality, which is of a peculiar musical character. It is heard over large cavities, and over the chest in pneumothorax.

8. Sibilant Breathing.—Its quality is whistling, its pitch high, its expiration prolonged.





**Sonorous Breathing.**—Its quality is sonorous, its pitch low, its expiration prolonged. Both sibilant and sonorous breathing are heard in some cases of acute and chronic bronchitis, in emphysema, and in asthma. They are supposed to be caused by irregular contraction of the walls of the bronchi.

### RÂLES.

The word *râle* is used to designate certain abnormal sounds which accompany the breathing. These sounds are not heard over healthy lungs. We distinguish *Crepitant*, *Subcrepitant*, *Coarse*, and *Gurgling Râles*.

1. The *Crepitant Râle* is a very fine, dry, crackling sound, heard only at the end of inspiration, not in expiration. The sound is developed abruptly in puffs immediately beneath the ear. It is often necessary to make the patient cough, in order to develop this *râle*. It is heard in pneumonia, in phthisis, and in dry pleurisy.

2. The *Subcrepitant Râle* is a fine, moist, bubbling sound, heard both in inspiration and in expiration. It is heard with bronchitis, pleurisy, pneumonia, phthisis, and œdema of the lungs.

3. *Coarse, Mucous, or Bronchial Râles* are like the *subcrepitant râle*, but louder and coarser. They are heard with acute and chronic bronchitis, pneumonia, and phthisis.

4. *Gurgling Râles* are very coarse *râles*, with a peculiar gurgling character. They are usually heard over small cavities, but sometimes in the bronchi of compressed lung.

If a patient has at the same time sibilant or sonorous breathing and *subcrepitant* or *coarse râles*, he may be said to have sibilant or sonorous *râles*.

### AUSCULTATION OF THE VOICE.

If we place our ear on a person's chest and cause him to speak, we hear at the same time the sound of the patient's voice as it is

transmitted through the air and through the wall of his chest. It is necessary for us to abstract our attention entirely from the first of these sounds, and only listen to that which is transmitted through the chest. In doing this we are much aided by the use of Cammann's stethoscope. The quality of the sound, however, is not as well appreciated by the stethoscope as by the ear alone.

In listening to the voice we must notice the intensity, the pitch, the quality, the distinctness, and the thrill.

Changes in the quality of the voice can sometimes be appreciated when the patient whispers, which are not heard when he speaks in an ordinary tone of voice.

1. *Laryngeal Voice*.—The quality is laryngeal, the intensity is great, the pitch is high, the distinctness is well marked, the thrill is also well marked. It is heard over the larynx and trachea.

2. *Pulmonary Voice*.—The quality is pulmonary, the intensity is feeble, the pitch is low; it is not at all distinct—there is but a moderate thrill. The intensity and the thrill are more marked in persons who have a sonorous and vibrating voice. It is heard all over the lungs. In the right infra-clavicular region the intensity of the voice is usually greater, the pitch higher, and the thrill more marked than in the corresponding region on the left side. In both inter-scapular regions the intensity is greater, the pitch higher, the distinctness and the thrill more marked than over the rest of the chest.

3. *Increased Vocal Resonance*.—The quality remains pulmonary, the intensity is increased, the pitch is higher, the thrill is more marked. It is heard over lung consolidated by pneumonia or phthisis, over lung compressed by fluid, over cavities, sometimes over lung attached to the chest-wall by old pleuritic adhesions, sometimes with emphysema.

4. *Diminished Vocal Resonance*.—The intensity and the thrill of the voice sounds are diminished. This is the case over small collections of fluid, with obstruction of the bronchi, over pleuritic adhesions, sometimes over consolidated lung.

5. *Suppressed Vocal Resonance*.—There is no voice sound trans-





mitted through the chest. This occurs with large collections of fluid in the pleural cavities, with intrathoracic tumors, sometimes over consolidated lung.

6. *Bronchophony*.—The quality is bronchial, the pitch is high, the intensity varies, the distinctness is more marked, the thrill varies in amount. The quality is usually better appreciated by the ear than by the stethoscope; it may be better marked when the patient whispers than with his full voice. Bronchophony is heard over consolidated and over compressed lung, and over cavities.

7. *Œgophony* is a modified bronchophony, differing from the latter only in its quality. The quality is of a peculiar tremulous character, and has been compared to the bleating of a goat. It can only be heard well in persons who have a vibrating voice, and it is necessary to make them say some word which brings out this vibrating character of the voice, such as "rant," "brant," etc. Œgophony is heard over lung compressed by fluid, just at the level of the fluid.

8. *Pectoriloquy*.—In pectoriloquy not only the sound of the voice, but the articulation of words is transmitted through the chest. This can often be best appreciated when the patient whispers. Pectoriloquy is heard over cavities and over solidified lung.

9. *Amphoric Voice*.—This resembles bronchophony, but the voice has a peculiar quality, like that of amphoric breathing. The quality is often best heard when the patient whispers. The amphoric voice is heard over large cavities and with hydro-pneumothorax.

10. *The Metallic Tinkle*.—This is a physical sign, heard both with the voice and with the breathing. It consists in a series of tinkling sounds of a high-pitched or metallic tone. It occurs irregularly at variable intervals. It is usually a sign of pneumothorax with perforation of the lung, but may be heard over large cavities.



**THE PHYSICAL SIGNS WHICH ACCOMPANY THE DISEASES OF THE LUNGS.****BRONCHITIS.****1. Acute Bronchitis affecting the larger tubes.**

Palpation may give a feeling of thrill in the wall of the thorax, transmitted from the bronchi. This is especially the case in children.

Percussion, as a rule, gives the same sounds as in health; rarely there is diminished resonance over a circumscribed area due to plugging of one or more bronchi.

Auscultation during the first twelve or twenty-four hours of the disease may give us nothing but respiration of a harder quality than the normal. After this there are usually râles, coarse and subcrepitant. Not infrequently there is also sibilant and sonorous breathing. The râles and the sibilant and sonorous breathing may cease for a time and then recur.

In chronic bronchitis we hear the same coarse and subcrepitant râles, with or without sibilant and sonorous breathing.

**2. Capillary Bronchitis.**

Percussion may give increased pulmonary resonance of low pitch.

Auscultation, in addition to the coarse and subcrepitant râles, may give very fine râles, which it is difficult to distinguish from crepitant râles.

**PNEUMONIA.**

**1. Acute Lobar Pneumonia of Adults.**—It is customary to describe three stages of pneumonia, namely: Congestion, Red Hepatization, and Resolution, and to ascribe physical signs to each of these stages. Such a division is, of course, somewhat schematic.

*First Stage.*—Commencing Hepatization gives us a crepitant râle and slight dulness.

*Second Stage.*—Complete Hepatization gives us bronchial breathing, bronchophony, dulness on percussion, increased vocal fremitus.





*Third Stage.*—Resolution gives crepitant and subcrepitant râles, bronchial voice and breathing become less and less marked, dulness decreases, vocal fremitus decreases.

*Exceptions.*—The crepitant râle may be entirely absent throughout the disease. It may persist throughout the stage of complete consolidation.

An acute bronchitis may precede and accompany the pneumonia, and there may be so many coarse râles as to drown all other respiratory sounds. There may be no bronchial breathing or bronchial voice—nothing but absence of the respiratory murmur.

The vocal fremitus, instead of being increased, may be diminished or almost entirely absent.

Instead of dulness on percussion, there may be tympanitic, or amphoric, or cracked-pot resonance.

*Pneumonia of Old Persons.*—In pneumonia occurring in persons over seventy years old the physical signs are often very obscure. The rational symptoms may precede the physical signs for several days. A moderate area of consolidation may give rise to very severe constitutional symptoms. All the physical signs may be absent, or there may be only a coarse crepitation, or only a moderate, circumscribed dulness.

*Pneumonia of Children.*—In children the consolidation of the lungs usually takes place in lobules, but there may be so many lobules consolidated as to constitute a lobar hepatization. If the hepatized lobules are small and scattered, the physical signs are those of bronchitis. If the hepatized lobules are larger and close together there may be dulness and bronchial breathing. The râles, however, are usually subcrepitant and coarse.

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#### PLEURISY.

We distinguish—

Pleurisy with the effusion of fibrine alone.

Pleurisy with the effusion of fibrine and serum.

Pleurisy with the production of pus.

Pleurisy with both pus and air in the pleural cavity.

Pleurisy with adhesions.

1. In pleurisy with the effusion of fibrine alone, the only physical sign is a friction sound. This friction sound may be a slight grazing sound, or resemble a crepitant râle, or a subcrepitant râle. In order to hear it it is well to make the patient cough, or take a deep inspiration.

2. Pleurisy with the effusion of fibrine and serum.

Inspection shows that the affected side moves less than the other, and is larger. The intercostal spaces may be bulged out.

Percussion gives, over the fluid, flatness; at and just above the fluid, dulness. Above the fluid, over the compressed lung, there is pulmonary resonance, or exaggerated resonance, or tympanitic resonance.

Auscultation may give a friction sound, if the fluid is small in amount. Below the level of the fluid there is absence of breathing, of voice, and of vocal fremitus. At the level of the fluid there may be ægophony. Above the level of the fluid there is exaggerated breathing and voice, or bronchial breathing and voice, or cavernous breathing.

If there is much fluid the heart will be displaced by it.

By changing the position of the patient the level of the fluid and the corresponding dulness may be changed.

Exceptionally we get bronchial breathing and voice below the level of the fluid. This is especially the case in children.

Sometimes, also, the vocal fremitus will persist below the level of the fluid.

3. Pleurisy with the production of pus—Empyema. The physical signs are the same as those just described.

4. Pleurisy with both pus and air in the pleural cavity—Hydropneumothorax. In some cases the physical signs are the same as those of pleurisy with serum or pus.

In other cases, in addition to these signs, we get, above the level of the fluid, amphoric breathing and voice, metallic tinkling, and tym-





panitic resonance. If the patient is shaken, we hear the splashing of the fluid within the chest—succussion.

5. Pleurisy with adhesions. There is dulness on percussion. Auscultation may give subcrepitant râles or a peculiar creaking sound. The voice may be either louder or less distinct.

*Pneumothorax.*—There may be air in a pleural cavity without fluid. We then have tympanitic resonance, suppressed breathing, diminished or suppressed vocal resonance and fremitus. If the lung is compressed, over it will be heard bronchial breathing and bronchophony.

### EMPHYSEMA.

By Emphysema we mean a condition of the lungs in which the air-vesicles are dilated and, at the same time, partially lose their power of expelling the inspired air from within them. Emphysema is very frequently associated with chronic bronchitis.

Percussion may give us—

- (1.) Pulmonary quality, high pitch, and greater intensity; or
- (2.) Exaggerated, low-pitched pulmonary resonance; or
- (3.) Resonance of dull quality, high pitch, and little intensity; or
- (4.) Normal pulmonary resonance.

In different cases we may get one or other of these different kinds of resonance.

*Inspection.*—In extreme cases of emphysema there is bulging of the infra-clavicular, mammary, and sternal regions, or of the anterior surface uniformly, or the entire thorax may assume a globular shape.

In many cases there is a bulging forward of the sternum and costal cartilages, involving either the whole length of the sternum or only its upper part.

*Auscultation.*—Inspiration is feeble, short, or may be almost suppressed. Expiration is longer, is sometimes also feeble, sometimes quite loud, but low-pitched. In some cases hardly any breathing sounds at all can be heard over the affected lung. In other cases



exactly the opposite occurs—both inspiration and expiration are loud and high-pitched.

If there is bronchitis, we may hear sibilant and sonorous breathing, and coarse and subcrepitant râles.

Vocal Resonance may be normal, or absent, or bronchophonic.

Vocal Fremitus may be normal, or increased, or diminished.

#### GANGRENE OF THE LUNG.

There is nothing characteristic in the physical signs of gangrene of the lung. If the gangrenous portion of the lung is of sufficient size, there will be dulness on percussion. If there is bronchitis with it, there will be subcrepitant and coarse râles. If the gangrenous lung tissue softens, there will be gurgling râles. The fetid odor of the breath is apt to be the most characteristic symptom.

#### ŒDEMA OF THE LUNGS.

This condition of the lungs is found in very different degrees, from a slight infiltration with serum to a complete filling up of the organ with fluid. In the extreme cases the lung is rendered as unfit for breathing as if it were hepatized.

In many cases we hear over œdematous lungs subcrepitant râles. Sometimes these râles are so fine as to resemble crepitant râles. If there is much œdema, there may be dulness on percussion.

#### ACUTE MILIARY TUBERCULOSIS.

In this disease the physical signs are not at all characteristic. If bronchitis accompanies the tubercular process, there will be subcrepitant and coarse râles. If there is no bronchitis, there will be no râles. There may be no change in the percussion sound, not even with a very large number of tubercles, or sometimes there is moderate dulness on percussion.





## PULMONARY PHTHISIS.

The lesions of phthisis differ very much in different cases, and so do the physical signs. It would be tedious to enumerate all the different conditions; we will only mention some of them.

1. There may be at the same time extensive interstitial and tubercular pneumonia, and a marked filling up of the air-vesicles with the products of inflammation, without any disposition to softening of the inflammatory products, and with little or no bronchitis. Under these circumstances, if only a small area of lung is involved, the physical signs are: Dulness on percussion, prolonged expiration, a louder and higher pitched vocal resonance, and increased vocal fremitus. If a larger area of lung is consolidated, there may be also bronchial voice and bronchial breathing.

2. There may be the same lesions of the lungs as have just been mentioned, but the inflammatory products *do* undergo softening, and there is bronchitis. Then, in addition to the physical signs of consolidation, there will be râles—subcrepitant, coarse, and gurgling.

3. There may be only an interstitial tubercular pneumonia, but hardly any filling up of the air-vesicles with inflammatory products. If such a lesion is only developed to a moderate extent, and there is no bronchitis, there are no physical signs. If there is bronchitis, there will be localized subcrepitant râles.

If the lesion is sufficiently extensive, there will be dulness on percussion, increased vocal resonance and fremitus, and prolonged expiration. Usually bronchitis with its râles are associated with this condition. The condition of the pleura, with either of the three conditions of lung just mentioned, may add to the physical signs. If there is dry pleurisy, we get friction sounds. If the pleura is much thickened, we get dulness on percussion, and either diminished or increased vocal resonance.

When phthisis has lasted for some time, there are apt to be one or several large or small cavities in the lung tissue.

If these cavities are small and surrounded by consolidated lung tissue, we get over them dulness on percussion; increased vocal resonance, or bronchophony; prolonged expiration, or cavernous breathing; gurgling râles.

If the cavities are of large size, percussion gives dulness, or tympanitic, or cracked-pot, or amphoric resonance. Auscultation gives cavernous, or amphoric, or bronchial breathing and voice. In very large cavities we may hear metallic tinkling. All these physical signs over cavities may vary from day to day, and be sometimes present and sometimes absent.

If the lung is diminished in size by the lesions of phthisis, the chest may be drawn inwards. Such a retraction may be circumscribed, as is often seen above and below the clavicles, or may involve a larger area.

## THE HEART.

### TOPOGRAPHY.

The position of the heart within the thorax can be seen in the plate. The area over which the anterior surface of the heart is uncovered by the lungs is of an irregular quadrangular shape. Its lateral diameter is from  $1\frac{1}{2}$  to  $4\frac{1}{2}$  inches; its upper boundary varies from the level of the second left costal cartilage to that of the fifth, but is usually behind the third or fourth cartilage, or the fourth space (Sibson).

The upper border of the heart is on a level with the third costal cartilage. The lower border extends from half an inch below the lower end of the sternum to the fifth left space. The left boundary of the heart, at its apex, is situated to the left of the junction of the fifth rib with its costal cartilage, and behind or to the left of a vertical line drawn downwards from the left nipple. The right boundary of the heart extends about an inch to the right of the right edge of the sternum.





If we look at the heart from behind, we find its base at the level of the spines of the sixth and seventh dorsal vertebræ, while its apex is at the level of the ninth rib.

The valves of the heart are situated as follows (Sibson):

The pulmonary valve in the majority of cases is either entirely or in part on the left side of the sternum, behind the second space or the third cartilage.

The aortic valve is usually at the level of the third cartilage or the third space, and behind the left two-thirds, or one-half of the sternum.

The mitral valve is oblique, the upper end to the left. It is on a level with the third cartilage to the fourth, near the middle of the sternum.

The tricuspid valve is oblique, its upper end to the left. The upper end is at the level of the third cartilage, the third space, or the fourth cartilage. The valve is opposite to the middle of the sternum.

*Impulse.*—The impulse of the heart is usually only visible at the apex in the fifth interspace, about midway between the line of the nipple and the left edge of the sternum. The force of the impulse varies very much in different persons. In some healthy adults there is also a distinct pulsation in the epigastrium. The impulse is synchronous with the systole of the ventricles, and with the first sound of the heart.

*Normal Cardiac Sounds.*—The contraction and relaxation of the cavities of the heart are accompanied with certain sounds, which we can hear. The first sound of the heart is synchronous with the systole of the ventricles, the heart's impulse, and the closure of the auriculo-ventricular valves. It is loudest at the apex.

After the first sound is a short interval of silence, the post-systolic silence. The second sound of the heart is synchronous with the diastole of the ventricles. It is heard most distinctly at the level of the third cartilage and over the middle of the sternum.



After the second sound is another interval of silence, the post-diastolic silence.

If the period of an entire revolution of the heart from the beginning of one first sound to the beginning of the next first sound, be divided into ten equal parts, the duration of the several periods of sound and silence will be as follows :

First Sound—4.

First Silence—1.

Second Sound—2.

Second Silence—3.

#### EXAMINATION OF THE HEART.

When we examine a patient's chest, to determine the condition of the heart, we must pay attention to the following things :

The size of the Heart.

The Impulse.

The Rhythm of the heart's movements.

The Heart Sounds.

Abnormal Sounds or Murmurs.

1. To determine the size of the heart you must locate by percussion the upper border of the heart, its right border, and its left border at the level of the nipple, also the position of the apex beat. You mark each of these points, and then, by connecting the marks, you have an outline of the heart.

The area of dulness over the heart is increased in size by effusions within the pericardium, by dilatation of the ventricles and auricles, and by hypertrophy of the ventricles. In pericarditis the serum first collects in the posterior part of the pericardial sac; then between the heart and the floor of the pericardium, lifting up the heart; then, as the fluid increases, the sac is distended, displacing the lungs laterally, and the diaphragm downwards. When the sac contains a large amount of fluid, the area of dulness is pear-shaped. Its apex is one





or two inches below the top of the sternum, and extends laterally over the whole width of this bone, and to the left over the first and second interspaces. The lower border of the area of dulness extends from one or more inches to the right of the lower part of the sternum to an inch beyond the left nipple, and downwards to the sixth cartilage (Sibson).

The area of heart dulness may be diminished by emphysema of the lungs, or by atrophy of the heart. It is very difficult to make out by percussion any diminution in the size of the heart.

### 2. *The Impulse*—

The apex beat is situated in the fifth interspace, midway between the left edge of the sternum and the line of the nipple. It can usually be felt by the hand, but in many healthy persons does not communicate any perceptible shock to the chest-wall. Its position must then be determined by the stethoscope. The force of the heart's impulse is temporarily increased by muscular exertion, by rapid respiration, by digestion, and by mental emotions.

Any disease which depresses the general vital forces may diminish the force of the impulse.

Fatty degeneration of the wall of the heart and accumulations of fluid within the pericardial sac diminish the force of the impulse.

Dilatation of the ventricles without hypertrophy changes the character of the impulse. Instead of a circumscribed apex beat there is a diffused, heaving impulse over the whole precordial region. The force of the impulse is increased by morbid functional excitement, by acute pericarditis and endocarditis, and especially by hypertrophy of the ventricles.

3. *The Rhythm*.—The heart normally contracts and dilates alternately in a perfectly regular way. The first and second heart sounds and the first and second silences follow each other in regular sequence. In some healthy persons, however, there is a regular intermission of the ventricular systole. The same thing occurs in the tubercular meningitis of children.

In other persons, again, the heart sounds are reduplicated. Either the systolic or the diastolic sound, or both of them, may be double. Such reduplication is said to be due to want of synchronism between the actions of the two sides of the heart.

The heart's action becomes irregular with valvular disease, dilatation and hypertrophy of the ventricles, fatty degeneration of the heart-wall, thrombosis of the heart, pericarditis, and from nervous influences.

4. The Heart Sounds have already been spoken of.
5. Abnormal Sounds or Murmurs.

We distinguish—

1. Pericardial Murmurs.
2. Valvular Murmurs.
3. Ventricular Murmurs.
4. Blood Murmurs.

1. Pericardial Murmurs are produced by the rubbing of the inflammatory products coating the visceral and parietal pericardium. Their character varies. The sound may be of a rubbing, grating, creaking, squeaking, or whistling character; or sometimes the sound resembles that of endocardial murmurs. The sounds may be very loud, or so faint as to be hardly audible. They are heard with the first or second sound of the heart, or with both; but are not always synchronous with these sounds. There may be a presystolic friction sound, synchronous with the contraction of the auricles.

There is no fixed point of maximum intensity of pericardial murmurs. They may be loudest at any point over the heart. Usually the sounds appear to be superficial. Pericardial murmurs are to be distinguished from endocardial murmurs by their rubbing quality; their superficial character; their limitation to a small area; their changeableness in position and intensity from hour to hour; their greater intensity when the patient leans forward; their want of synchronism with the heart sounds (Walshe). In some cases the two kinds of murmurs (pericardial and endocardial) cannot be distinguished.





(2.) Valvular Murmurs are produced by changes in the valves. The result of such changes is that the valves are rendered insufficient, or rigid, or rough. Such changes in the valves are very much more frequent on the left side of the heart than on the right.

#### OBSTRUCTION OF THE AORTIC ORIFICE.

If the aortic valves are roughened, or if they are rigid, we may hear a murmur with the first sound of the heart and during the first silence. This murmur is loudest at midsternum, opposite the third interspace, and is transmitted upwards and to the right. It can sometimes be heard behind, on the left side of the second, third, and fourth dorsal vertebræ.

Sometimes, however, the murmur is loudest over the lower end of the sternum; sometimes it is louder on the left side of the sternum than on the right; sometimes it is loudest at the level of the second cartilage.

There may be well-marked aortic stenosis without any murmur.

#### INSUFFICIENCY OF THE AORTIC VALVES.

We usually hear a murmur with the second sound of the heart, loudest at midsternum at the level of the third interspace. The murmur is conducted upwards and to the right, downwards along the sternum. Sometimes the murmur is loudest at the lower end of the sternum. It may be loudest at the fourth space to the left of the sternum, or at the apex.

#### STENOSIS OF THE MITRAL ORIFICE.

With this condition we may hear a murmur during the second silence of the heart. It is usually called a præ systolic murmur. The murmur is loudest at the apex of the heart; it is often limited to a



small area around the apex; sometimes it is transmitted to the left and backwards. Not infrequently mitral stenosis exists without any murmur.

#### INSUFFICIENCY OF THE MITRAL VALVE.

To this lesion belongs a murmur heard with the first sound and during the first silence. The murmur is loudest at the apex of the heart, is transmitted to the left and backwards, and should be audible about and within the lower angle of the left scapula, and in the left vertebral groove from the sixth to the ninth dorsal vertebræ.

#### STENOSIS OF THE PULMONARY ORIFICE.

Of the physical signs belonging to this lesion we have no certain knowledge. There should be a systolic murmur loudest over the second space at the left edge of the sternum, and not transmitted into the carotids (Flint).

#### INSUFFICIENCY OF THE PULMONARY VALVES.

Of this lesion our knowledge is equally uncertain.

*Stenosis of the Tricuspid Orifice* is said to give a præ systolic murmur, loudest at the ensiform cartilage, [very faint at the left apex, and inaudible at the base.

*Insufficiency of the Tricuspid Valve* may give a murmur heard with the first sound of the heart and during the first silence. This murmur is loudest just above or at the ensiform cartilage, nearly inaudible at the left apex, and is not transmitted upwards. A venous pulse on the right side of the neck, synchronous with the contraction of the ventricles, is evidence of tricuspid regurgitation (Flint).

Besides the murmurs spoken of, due to actual lesions of the valves, we also hear murmurs produced at the orifices of the heart without





any structural change in the valves. These murmurs are due to unnatural violence in the muscular action of the ventricles.

Such murmurs are heard with the first sound of the heart at the left apex, denoting regurgitation (probably) at the mitral orifice. Such a murmur is not heard over the back. At the base of the heart also, with the first sound, we may get similar dynamic murmurs.

3. *Ventricular Murmurs*.—A roughened condition of the endocardium of the ventricles, or of the chordæ tendineæ, a tendinous cord stretching across a ventricle, and thrombi within the ventricles, may produce murmurs. These murmurs are heard with the first sound of the heart and during the first silence. They are loudest over a circumscribed area about the apex, and are usually not transmitted for any distance.

4. *Blood Murmurs*.—If the composition of the blood is changed so that it contains more fluid and less solid matters, this condition may produce a murmur. This murmur is always systolic, and is produced at the aortic and pulmonary orifice. It is loudest at the base of the heart, is usually conducted upwards along the great vessels, and is not heard at the left apex.

#### ANEURISM OF THE ARCH OF THE AORTA.

Although there are different anatomical varieties of aneurism of the aorta, yet their physical signs are due to the same conditions: (1) the existence of a tumor; (2) the pressure of this tumor upon surrounding parts.

The physical signs due to the existence of a tumor vary with its size, its position, and the condition of the blood—whether coagulated or not—within the aneurism. If the aneurism is small, or situated on the posterior or lateral walls of the aorta, there may be no physical signs. If the aneurism is sufficiently large, the physical signs are dullness on percussion, a murmur, a thrill, and a pulsating tumor.

If the sac springs from the ascending portion of the arch of the

aorta, the tumor is at the right edge of the sternum, beneath the second interspace and cartilage up to the first cartilage. If the sac is on the transverse portion of the arch, the tumor is beneath the top of the sternum. If the sac is on the descending portion of the arch, the tumor is beneath the second left cartilage, and extends laterally to the left. There are, however, many exceptions to these rules of position.

Of the four signs belonging to an aneurismal tumor, the dulness is much the most constant; next in frequency is the pulsation, while the murmur and thrill are often absent. When the murmur does exist, it is usually a double one.

The pressure of the aneurism on adjacent parts gives rise to very important symptoms.

Pressure on the descending vena cava produced congestion of the veins of the neck and upper part of the thorax, with œdema.

Pressure on the trachea or bronchi causes dyspnœa, tracheitis, and bronchitis, and sometimes a peculiar form of pneumonia.

Pressure on the œsophagus causes difficulty in swallowing.

Pressure on the recurrent laryngeal nerves produces cough, laryngeal dyspnœa, and sometimes paralysis of one of the vocal cords.

Pressure on the brachial plexus of nerves gives rise to intense pain.

If the carotid, the subclavian, or the innominate artery become occluded, there will be a difference in the pulsation of the carotid and radial arteries on the two sides of the body.











